BRAUN INTERTEC

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6875 Washington Avenue South
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Engineers and Scientists Serving the Built and Natural Environments®

June 17, 1996

Mr Richard Ingberg
Regional Engineer
6875 Washington Avenue South
P O Box 39108
Minneapolis, MN 55439-0108

Dear Mr Ingberg

Enclosed is the construction report for the SPS-6 Iowa project

If you have any questions about this report please call Ronald Urbach or Benjamin Worel

Sincerely,

Ronald R Urbach

Ronald R Urbach, CET

Benjamin J Worel, PE

Attachment Report

c Mr Monte Symons, FHWA
Mr John Miller, PCS/Law
Mr Cameron Kruse, Braun Intertec

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SPS-6 Construction Report
I-35 Southbound
Between Ames and Des Moines, Iowa
Test Sections 190601 - 190608

Federal Highway Administration
Long Term Pavement Performance
North Central Region

Report Prepared By

Ronald R Urbach, CET
Benjamin J Worel, PE
Braun Intertec Corporation
6875 Washington Avenue South
P O Box 39108
Minneapolis, MN 55439-0108

Project DBNX-92-700
June 17, 1996

Table of Contents

1.0 Introduction

The SPS-6 is a study of rehabilitation of jointed Portland Cement Concrete (PCC) pavement It is a study of various PCC concrete restoration techniques in combination with variations of overlay thicknesses

1.1 Experimental Cell

The project is located in the wet-freeze environmental zone The subgrade soil is fine grained The existing pavement was in poor condition

1.2 Summary of Supplemental Sections

There were no agency supplemental test sections

1.3 Project Location

The SPS project is located on southbound Interstate 35 between Ames and Des Moines, Iowa The test sections are located between mileposts 98 82 and 94 75

1.4 Type of Roadway

The existing pavement was jointed reinforced concrete pavement (JRCP) with doweled joint spacings at 76 5 feet The pavement thickness is 10 inches with a 4-inch granular base The original JRCP was opened to traffic in 1965

1.5 Traffic Characteristics

The daily traffic on this project measured in 1986 was 15,600 AADT Of this, 20 6 percent were trucks Three of these test sections are placed north of the exit ramp for County Road F22 The other six are placed south of the ramp The AADT for the off-ramp to County Road F22 is 470 AADT Of this, 8 2 percent are trucks The on-ramp off County Road F22 to southbound Interstate 35 has an AADT of 120 vehicles with 8 percent trucks, which would indicate that there are approximately 350 AADT counts on the northern test sections that are not on the southern test sections The truck count is essentially the same

1.6 Known Deviations From Guidelines

The Strategic Highway Research Program (SHRP) guidelines were being developed when this SPS-6 project was constructed in 1989 See the Deviation Report in Appendix D Rod and level measurements were performed to document the overlay thickness

1.7 Geometry

The roadway is straight with vertical grades of up to 2 5 percent There is a diamond interchange within the project at about Station 492+00 (Milepost 96 5)

1.8 Underground Structures Within Test Sections

The test sections were located to avoid underground structures

1.9 Installation of Weather Station

No weather station is required for this project

1.10 Installation of the WIM

Iowa Department of Transportation (DOT) personnel installed the piezo film and cable system The WIM was placed at Station 495+50 to Station 496+00

1.11 Schedule for Opening to Traffic

The patching of the existing JRCP started in July, 1989 The rehabilitation was completed and opened to traffic on September 15, 1989

1.12 General Problems

There were some weather- and equipment-related delays

1.13 Resident Engineer Information

Iowa Department of Transportation Representatives

Ms Vicki Dumdei
Resident Construction Engineer
Iowa Department of Transportation
Ames Rec Office
US 30 East
Ames, IA 50010
Phone (515) 239-1033

Mr Bernard Brown, Materials Engineer

Mr Charles Potter
Assistant Special Investigations Engineer, Materials
Iowa Department of Transportation
800 Lincoln Way
Ames, IA 50010
Phone (515) 239-1452
Fax (515) 232-0808

Representatives from the North Central Regional Office

Dr Eugene Skok
Mr Erland Lukanen
Braun Intertec Corporation
6875 Washington Avenue South
Minneapolis, MN 55439-0108
Phone (612) 941-5600
Fax (612) 942-3059

SHRP Regional Engineer

Mr Richard Ingberg
6875 Washington Avenue South
P O Box 39108
Minneapolis, MN 55439-0108
Phone (612) 800-344-7477
Fax (612) 942-3059

1.14 Materials Sampling and Testing

The preconstruction materials sampling and testing was completed by the SHRP drilling and sampling contractor during July, 1989

Mr Mark Flynn
Braun Intertec Corporation
6801 Washington Avenue South
P O Box 39108
Minneapolis, MN 55439-0108

1.15 Contractor Information

Des Moines Asphalt and Paving Company of Iowa was the general/paving contractor for the project See Attachment F, letter dated November 8, 1995, requesting additional information

1.16 Summary of Key Construction Equipment

Pavement Preparation and Restoration

Crack, Break and Seat
- Wertgen "Guillotine" drop hammer
- 50-ton seating roller towed by a front-end loader

Partial- and Full-Depth Patching
- Saw with Diamond blade
- Jack hammer
- Front-end loader and backhoe
- Doweling jig
- Wheel saw with carbide bits

Joint Sealing
- Saw with Diamond blade
- Air compressor
- Sandblast equipment
- Sealant application equipment

Surface Grinding
- Diamond grinder with 30-inch wide cutting head

Asphalt Overlay
Cedar Rapids batch plant 250-ton per hour
Cedar Rapids Model 561 paver
Breakdown Roller
16-ton Ingersoll Rand Model DD145 double-drum vibratory
Intermediate
Hyster Model C550A pnuematic-tired
Finish Roller
11 25-ton Ingersoll Rand Model DA 50 steel-wheel tandem

2.0 Project Details

The type of maintenance and service preparation follow Preconstruction falling weight deflectometer (FWD) testing was performed by the SHRP North Central Region FWD The Iowa DOT also did testing with a Model 400 Road Rater at the same time and location

This data will be used for correlation between the road rater and the FWD

Patching

- Sawing along the outline of the patch area with a wheel with tungsten carbide bits
- The concrete was broken up with a jackhammer and removed with a backhoe The base and subgrade were also removed to about 1 foot below the bottom of the concrete
- The base/subgrade excavation was backfilled with crushed aggregate Compaction was provided with a hand-operated tamping device
- Smooth dowels were set in the transverse edges of the in-place concrete with epoxy The tie bars were No 4 deformed about 24 to 30 inches long The dowels were 16 inches long and 1-1/8 inch in diameter
- The concrete was delivered to the site by a ready mix-truck The transverse patches were hand screened in a transverse direction to match the transverse profile

Crack and Seating

- Cracking A Wertgen "guillotine" hammer was used to crack the pavement The hammer impacts were spaced at 18 inches
- Seating Seating took place with a 50-ton roller towed by a front-end load Many parts of the section, however, received eight applications of the roller
- Grinding Operation The grinding device consisted of a number of diamond saws on a mandrill Each saw was approximately 3/16 inch in width and left about 1/8 inch between saw cuts and the machine was set to grind approximately 1/8 inch to 3/16 inch from the pavement surface on average

Asphalt Overlay

- Plant visit to Des Moines asphalt plant This plant is a Cedar Rapids batch plant It had a capacity of about 250 tons per hour They were running about one minute ten seconds per batch and were dumping directly into the trucks Travel time is estimated to be about 30 to 40 minutes from the plant to the paver
- Paving Operation The tack coat was applied about one mile ahead of the paving operation

while the overlay consisted of a 2-inch binder and 2-inch wear for the 4-inch overlay and two 3-inch binder courses and a 2-inch wear for the 8-inch overlay Compaction equipment consisted of a dual drum vibratory roller, for breakdown, an intermediate pneumatic roller and a steel finishing roller Compaction was done after rolling pattern established on a test strip

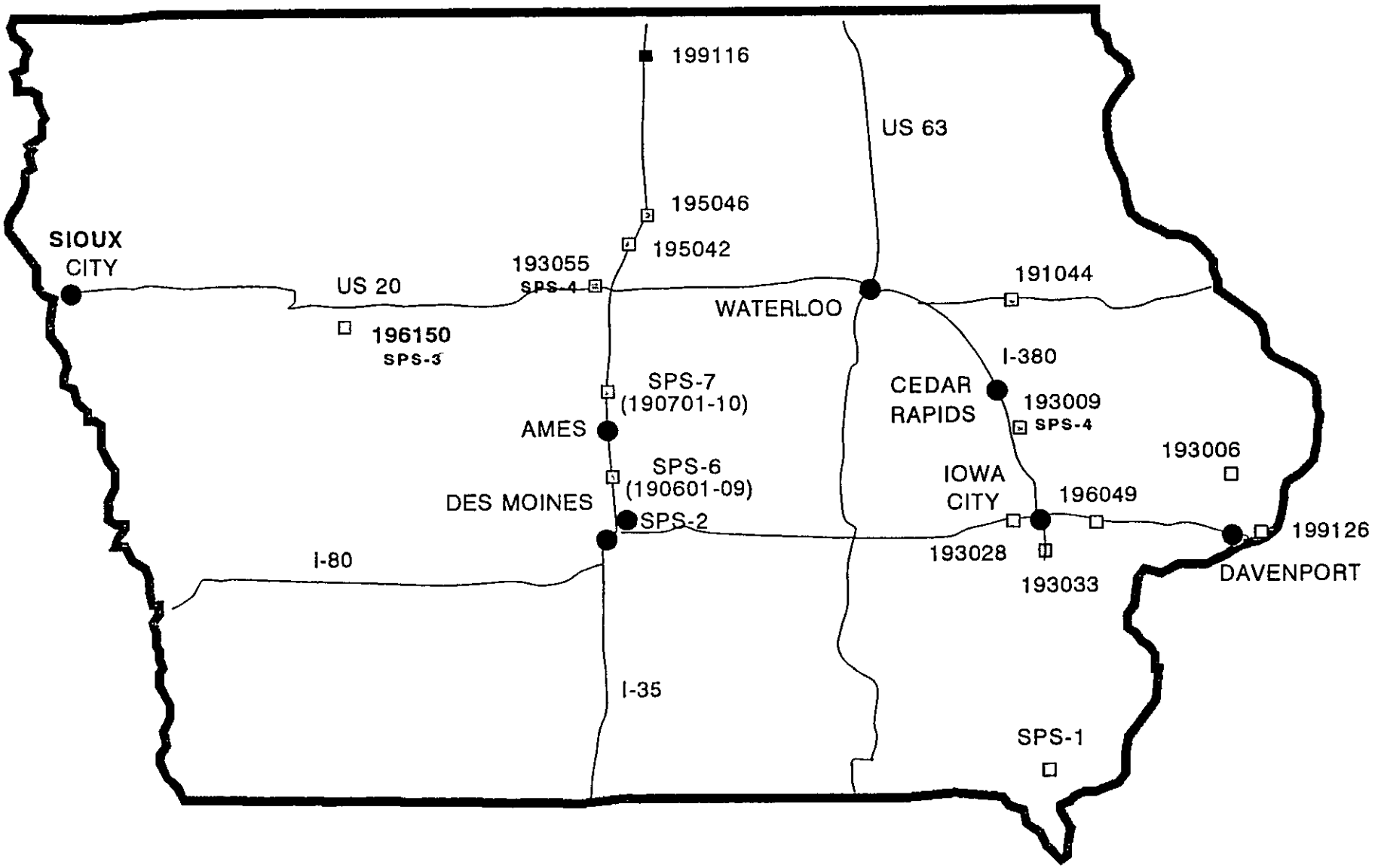
The mix designs for the asphalt overlays were performed by the Iowa DOT office of materials in Ames, Iowa The binder or below surface mixes were designed using recycled materials The surface mix for the overlays used all virgin material The mix designs were modified during production The asphalt content was lowered to increase the voids in the mix placed By increasing the voids in the mix, it will add to the durability of the asphalt Samples were taken and shipped to the Materials Reference Library (MRL) of materials used for the asphalt overlays

In July, 1990, joint/crack monitoring gauges were placed in test sections 190607, 190608 and 190603 These joint/crack monitoring gauges were installed under the SHRP contract SP-202

Attachment A

Project Location Site Map

LTPP TEST SITE LOCATIONS
IOWA
GENERAL PAVEMENT STUDIES



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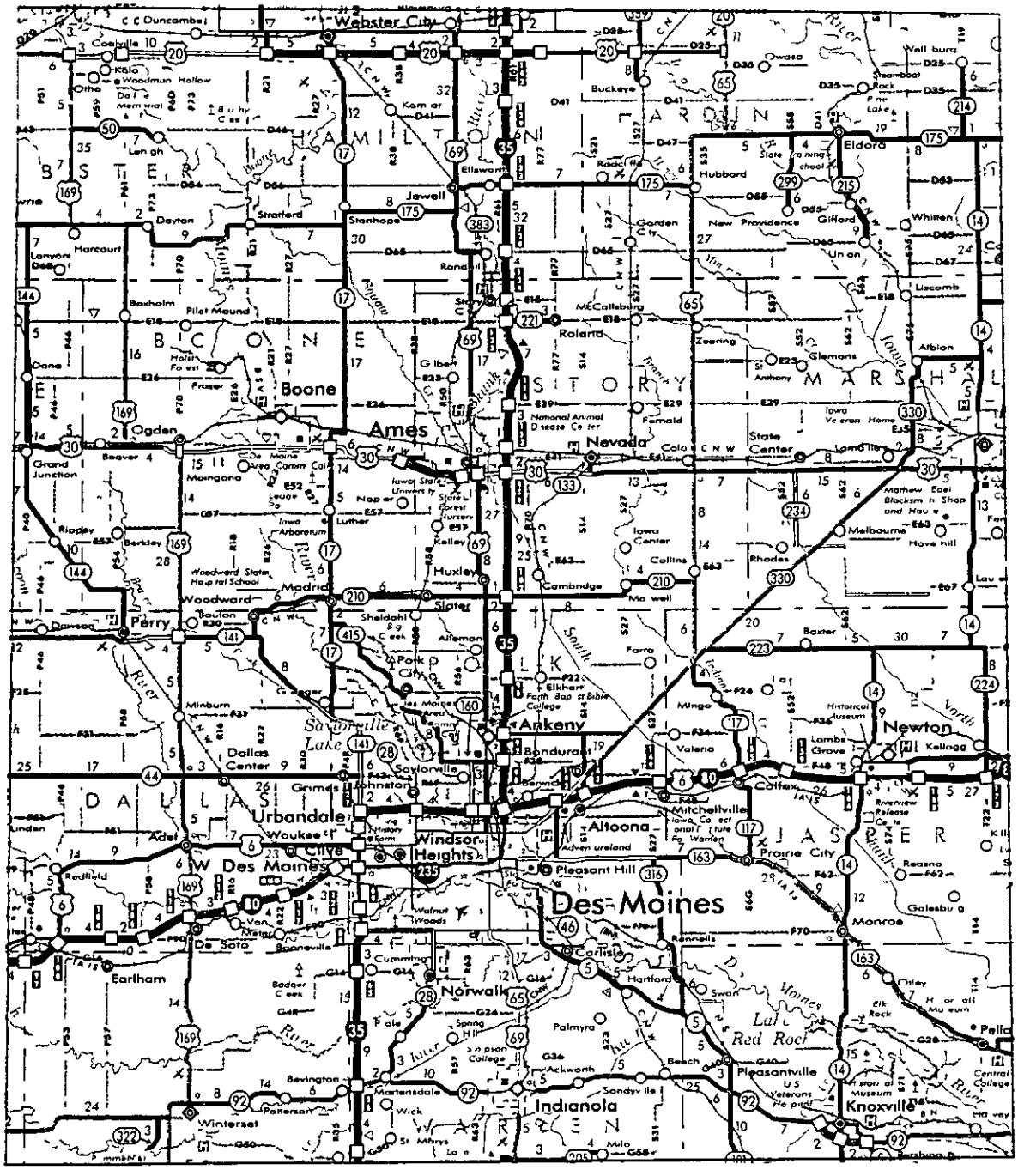
DECEMBER 1994

Attachment B

Project Location Map

BRAUN SM
INTERTEC

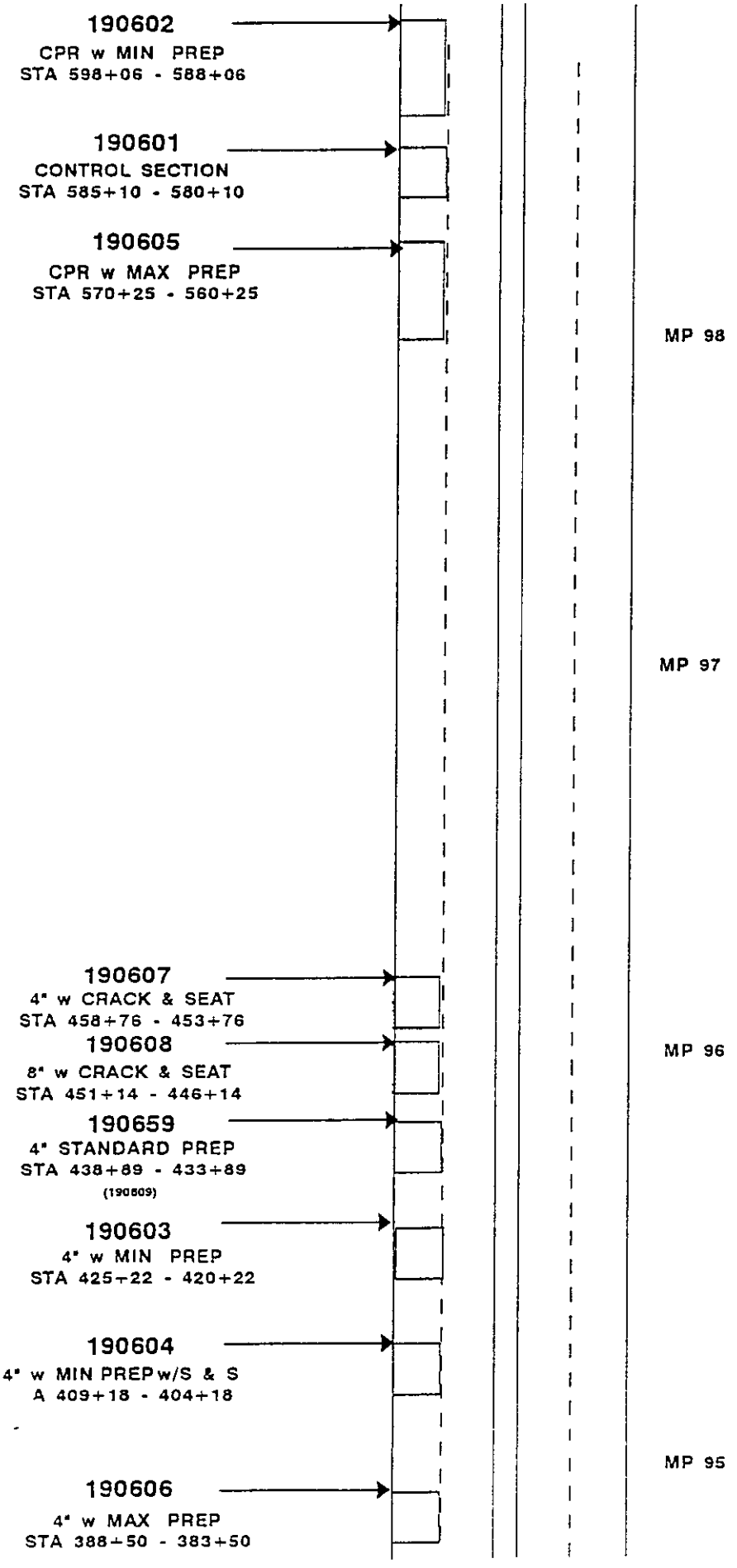


NORTH

ATTACHMENT 3

Attachment C

Test Section Layout



SPS-6 LAYOUT
I-35
SOUTHBOUND LANE
POLK COUNTY
IOWA

01/19/94

G \USERS\SHP\MAPS\SPS SPS6_IA CH3

N

Attachment D

Project Deviation Report

LTPP SPS-6 Project Deviation Report Project Summary Sheet	State Code 1 9 Project Code 0 6 0 0

Project Classification Information	
SPS Experiment Number SPS-6	State or Province Iowa
LTPP Region	☐ North Atlantic ■ North Central ☐ Southern ☐ Western
Climate Zone	☐ Dry-Freeze ☐ Dry-No Freeze ■ Wet-Freeze ☐ Wet-No Freeze
Subgrade Classification	■ Fine Grain ☐ Coarse Grain ☐ Active (SPS-8 Only)
Project Experiment Classification Designation (SPS 1, 2 and 8) Not Applicable	
Construction Start Date July 1989	Construction End Date September 15, 1989
FHWA Incentive Funds Provided to Agency for this Project	■ Yes ☐ No

Deviation Summary	
Site Location Deviations	☐ No Deviations ☐ Minor Deviations ■ Significant Deviations
Construction Deviations	☐ No Deviations ■ Minor Deviations ☐ Significant Deviations

Data Collection and Processing Status Summary	
Inventory Data (SPS 5,6,7,9)	☐ Complete Submission ■ Incomplete ☐ Data Not Available
Materials Data	☐ All Scheduled Samples Obtained and Tested ■ Incomplete
Construction Data	☐ All Required Data Obtained ■ Incomplete/Missing Data Elements
Historical Traffic Data	■ All Required Historical Estimates Submitted (SPS 5,6,7,9) ☐ Required Estimates Not Submitted
Traffic Monitoring Equipment Site Related	■ WIM Installed On-Site ☐ AVC Installed On-Site ☐ ATR Installed On-Site ☐ No Equipment Installed
Traffic Monitoring	☐ Preferred ■ Continuous ☐ Minimum ☐ Below Minimum ☐ Site Related
Traffic Monitoring Data	■ Monitoring Data Submitted ☐ No Monitoring Data Submitted
FWD Measurements	■ Preconstruction Tests Performed ☐ Construction Tests Performed ■ Post-construction Tests Performed
Profile Measurements	■ Preconstruction Tests Performed ■ Post-Construction Tests Performed
Distress Measurements	■ Preconstruction Tests Performed ■ Post-Construction Tests Performed
Maint & Rehab Data	☐ Complete Submission ■ Incomplete ☐ Data Not Available
Friction Data	☐ Complete Submission ■ Incomplete ☐ Data Not Available

Report Status	
Materials Sampling and Test Plan	■ Document Prepared ☐ Final Submitted to FHWA
Construction Report	■ Document Prepared ☐ Final Submitted to FHWA
AWS (SPS 1, 2, & 8) Not Applicable	☐ AWS Installed ☐ AWS Installation Report Submitted to FHWA

Preparer Ronald Urbach Date June 17, 1996

LTPP SPS-6 Project Deviation Report Data Collection and Materials Sampling and Testing Deviations	State Code 19 Project Code 0 6 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s) (Specify) _____

Data Collection and Materials Sampling and Testing Deviation Comments

The SPS-6 guidelines were still being developed when the project was constructed in 1989

No rod and level measurements were performed to document the overlay thickness

General lack of knowledge of SPS projects This was a pilot SPS-6 project

With this lack of knowledge, construction datasheets were not completed as required in the guidelines

 Preparer Ronald Urbach Date June 17, 1996

LTPP SPS-6 Project Deviation Report Site Location Guidelines Deviations	State Code 19 Project Code 06 00

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s) (Specify) _____

Site Location Guideline Deviation Comments

SPS-6 guidelines were still being developed

Data collection, material sampling and testing were completed with limited knowledge about SPS-6 projects

The laboratory testing was performed by the LTPP laboratory testing contractors

Manual distress surveys were performed using first generation guidelines

 Preparer Ronald Urbach Date June 17, 1996

LTPP SPS-6 Project Deviation Report Construction Guidelines Deviations	State Code 19 Project Code 06 00

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s) (Specify) _____

Construction Guidelines Deviation Comments

This deviation report is part of the construction report

Preparer Ronald Urbach

Date June 17, 1996

LTPP SPS-6 Project Deviation Report
Other Deviations

State Code 19
Project Code 0 6 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s) (Specify) _____

Other Deviation Comments

Three test sections (190602, 190601, 190605) are located north of the exit for Elkhart

The remainder of the test sections are south of the exit ramp

The net difference in AADT on the test sections north of the ramp is 350 AADT more than south of the ramp

The percentage of trucks is about the same

Preparer Ronald Urbach

Date June 17, 1996

Attachment E

Pre and Post Construction Sampling and Testing Plan

TRDF

MEMORANDUM

TECH MEMO NO: TM-EC-21 DATE. June 30, 1989
AUTHOR Gary Elkins and Jonathan Groeger FILE. T-001
DISTRIBUTION: Dr. A. Hanna, Jim Walls, Gene Skok, Dick Ingberg
SUBJECT Recommended materials sampling plan for SPS-6 site in Iowa

Enclosed are figures which present the recommended pre-construction field materials sampling plan for the SPS-6 site in Iowa. This plan was prepared based on the information provided to us from Braun Pavement Technologies and Iowa DOT Adjustments may be necessary in the field based on site specific considerations This plan contains what we feel is the minimum to meet the materials characterization needs for the SPS-6 experiment We are currently working on a complete set of guidelines for test section numbering, test section marking, before and after monitoring measurements, and materials sampling during construction and after construction for the SPS-6 experiment These guidelines will be similar to those contained in the report on Sampling, Testing and Monitoring Activities, for SPS-5 in Yazoo County Mississippi, June 1989 This report should be completed in the near future.

The field material sampling and testing activities should be performed in accordance with SHRP directives for sampling and testing of GPS test sections It is desired to perform FWD tests on each SPS-6 test section using the same procedures for GPS-3 test sections. However, until SHRP can develop a uniform policy on deflection measurements on the SPS-6 test sections, I recommend that you use your own judgement in reducing the intensity of FWD measurements so that they can be completed in a reasonable time frame You might discuss this directly with Cheryl Richter to explain the constraints and get her opinion on your plan for FWD testing on the SPS-6 test sections You might also contact Scott Rabinow for his opinion

GEE/JG/gee
TMEC21 GEE

6811 Kenilworth Ave Suite 230 • Riverdale Maryland 20737 • (301) 779-2505 • FAX 1-301-779 2507

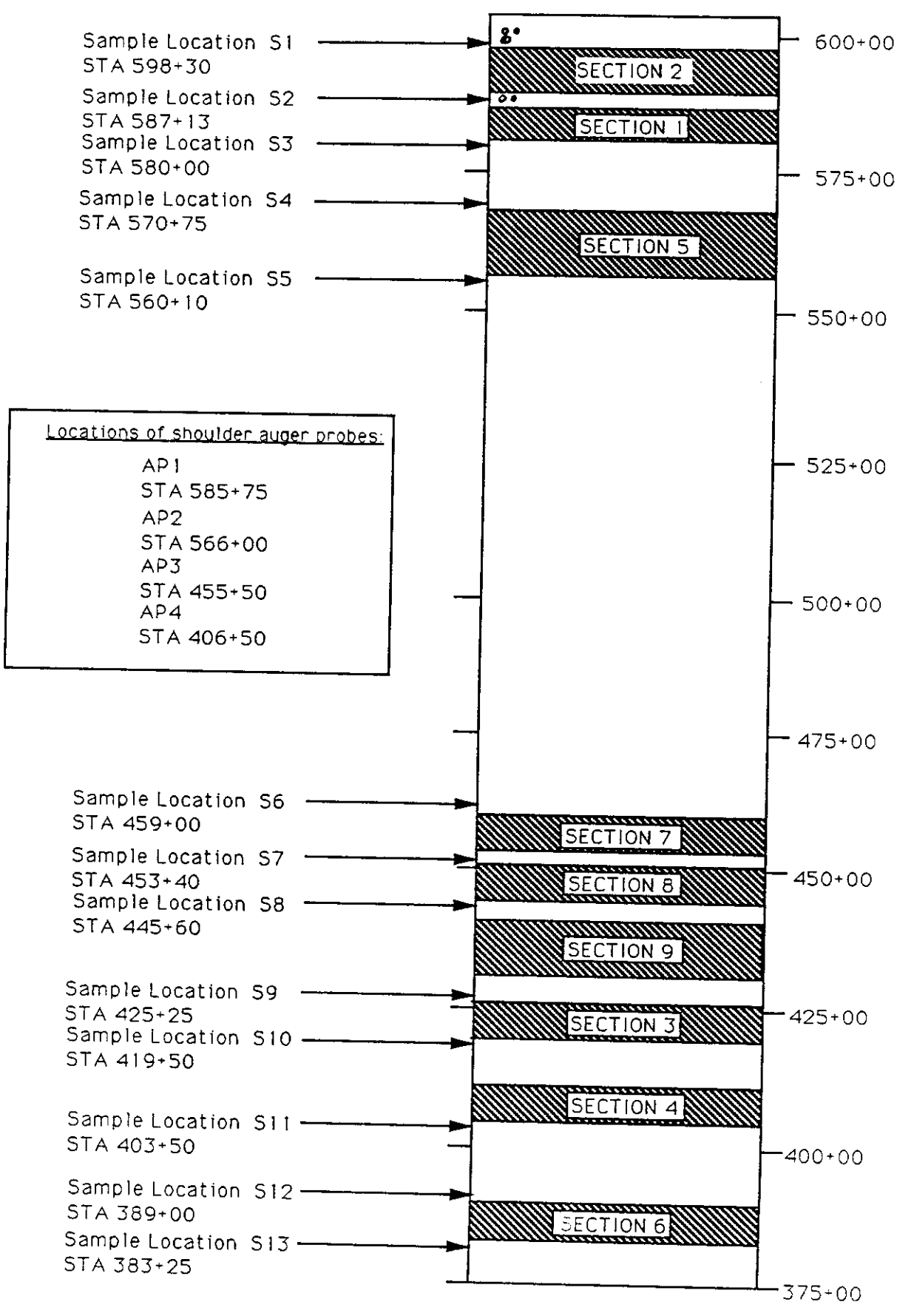
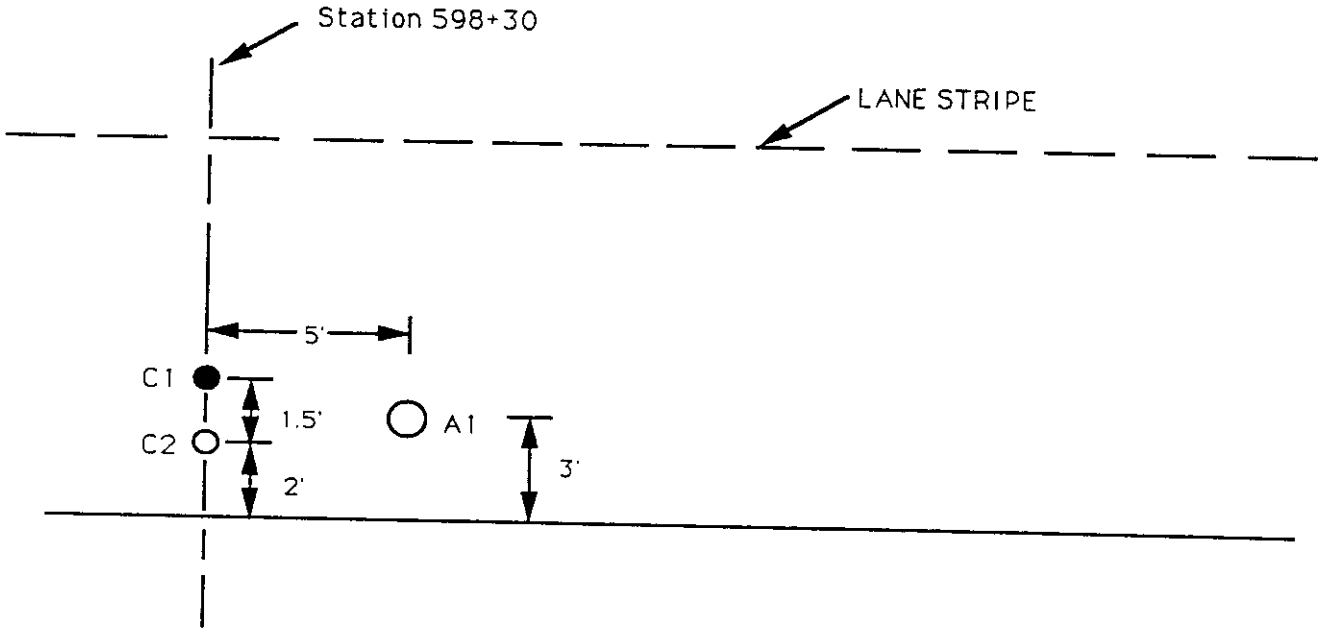


Figure 1. Layout of test sections and locations of in-place sampling areas.

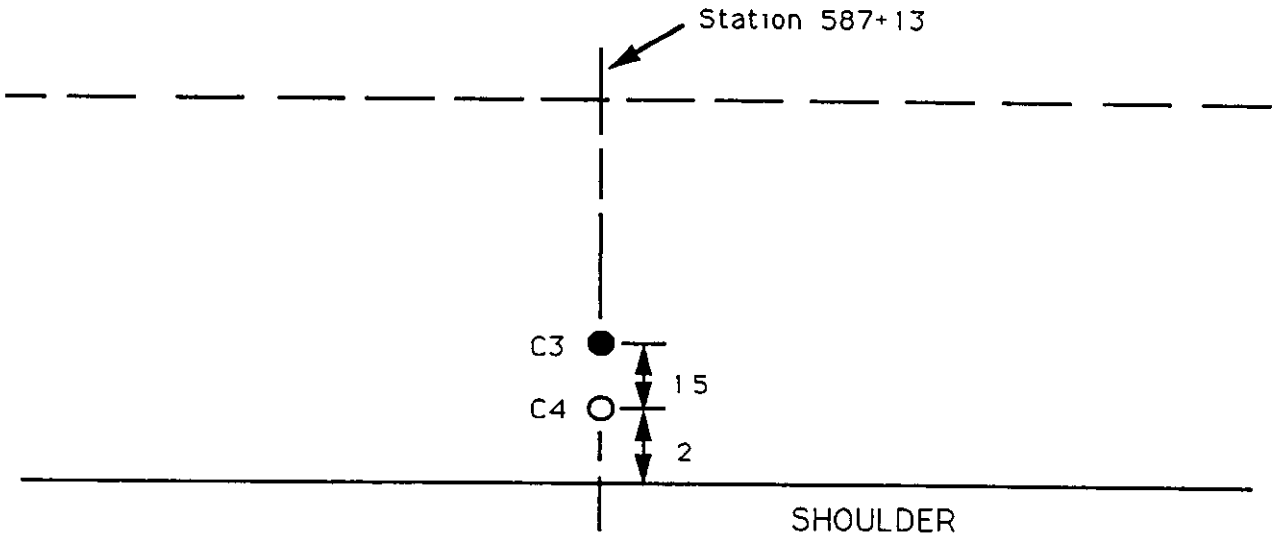


● 4" OD core of PCC pavement surface: C1

○ 4" OD core of PCC pavement surface and treated layers: C2

◯ 6" OD core of PCC pavement and treated layers; augering of unstabilized base and subbase; thin-walled tube sampling and/or splitspoon sampling as directed by authorized SHRP representative to 5' below top of subgrade: A1

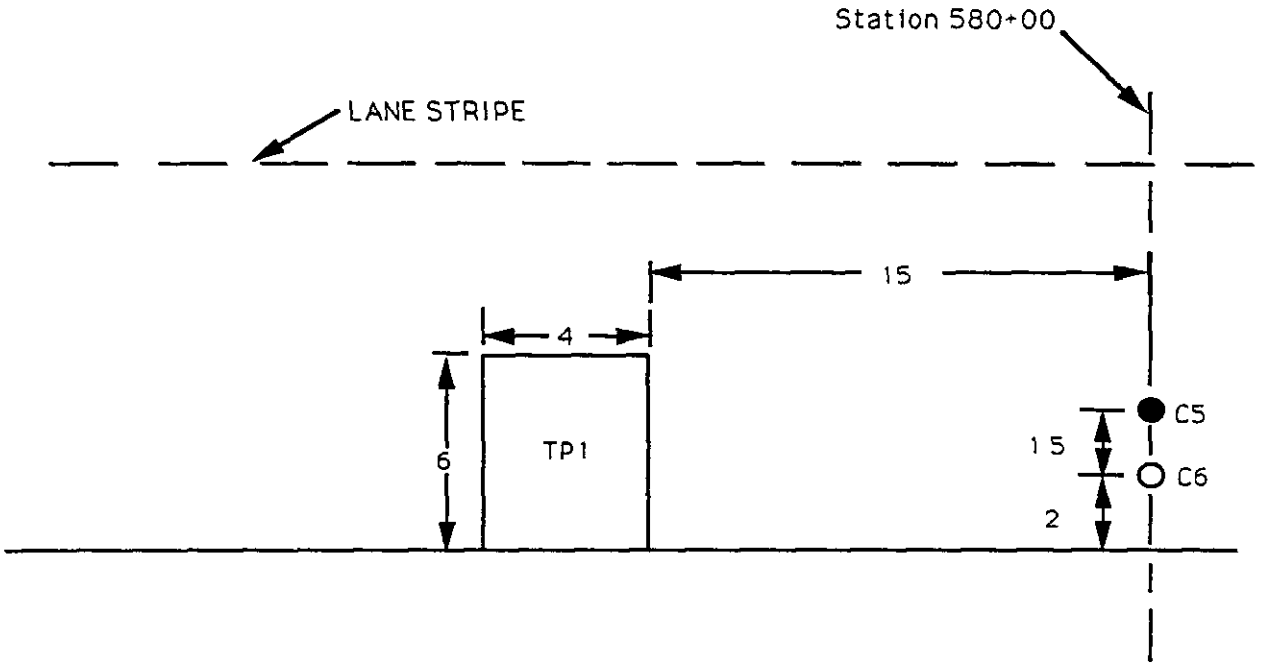
Figure 2. Sampling plan for station 598+30 before section 2. Sampling area S1.



● 4" OD core of PCC pavement surface C3

○ 4" OD core of PCC pavement surface and treated layers C4

Figure 3 Sampling plan for station 587+13 between sections 1 and 2 Sampling area S2

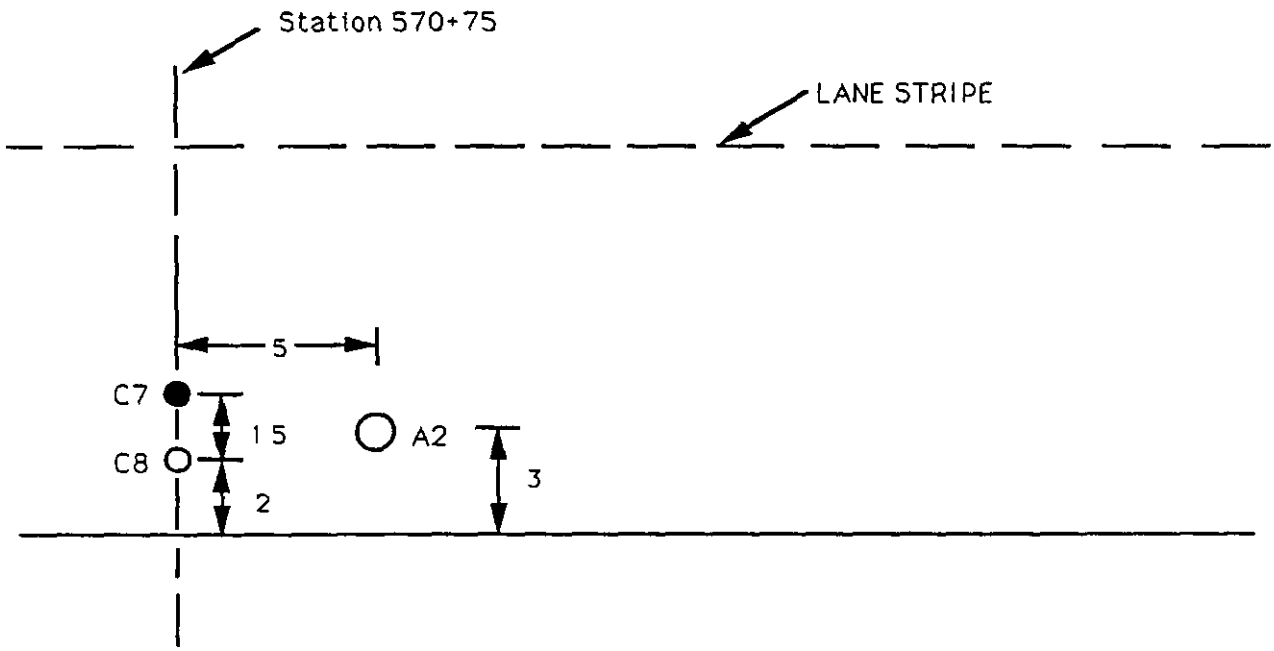


● 4" OD core of PCC pavement surface C5

O 4" OD core of PCC pavement surface and treated base C6

4' X 6' test pit to 12" below top of subgrade Removal of pavement layers, collection of pavement slabs, nuclear density and moisture measurements on unstabilized layers and subgrade, bulk sampling of unstabilized layers and subgrade TP1

Figure 4 Sampling plan for station 580+00 after section 1 Sampling area S3

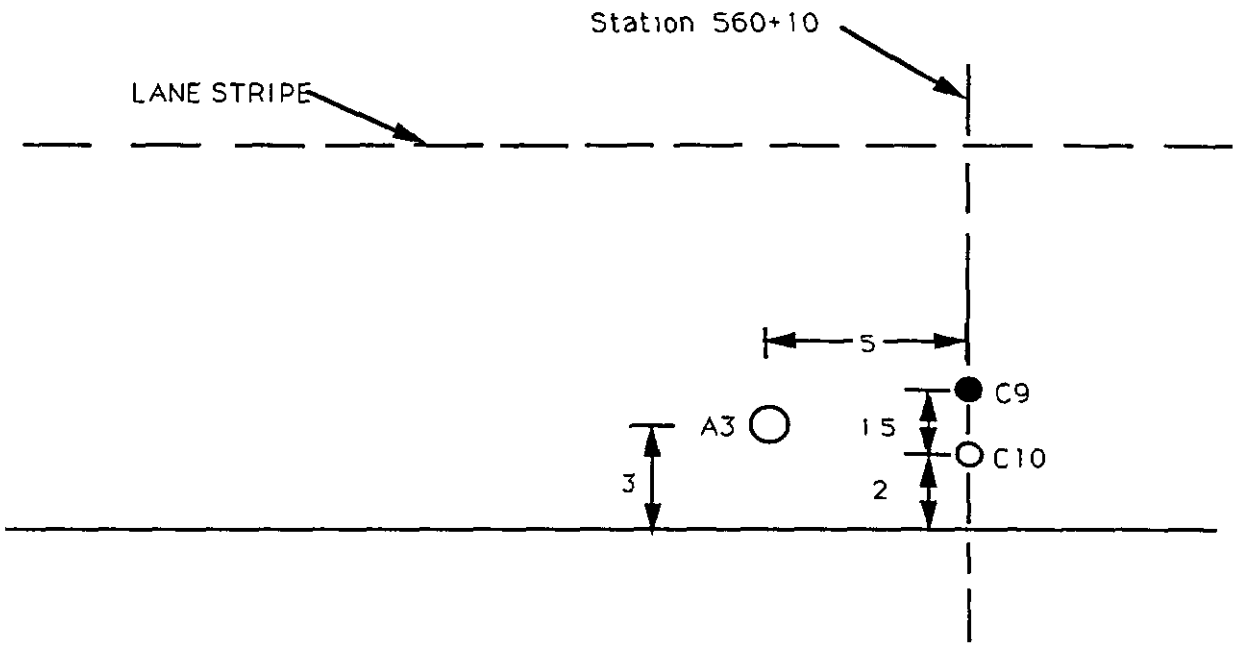


● 4" OD core of PCC pavement surface C7

○ 4" OD core of PCC pavement surface and treated layers C8

○ 6" OD core of PCC pavement and treated layers, augering of unstabilized base and subbase, thin-walled tube sampling and/or splitspoon sampling as directed by authorized SHRP representative to 5' below top of subgrade A2

Figure 5 Sampling plan for station 570+75 before section 5 Sampling area S4

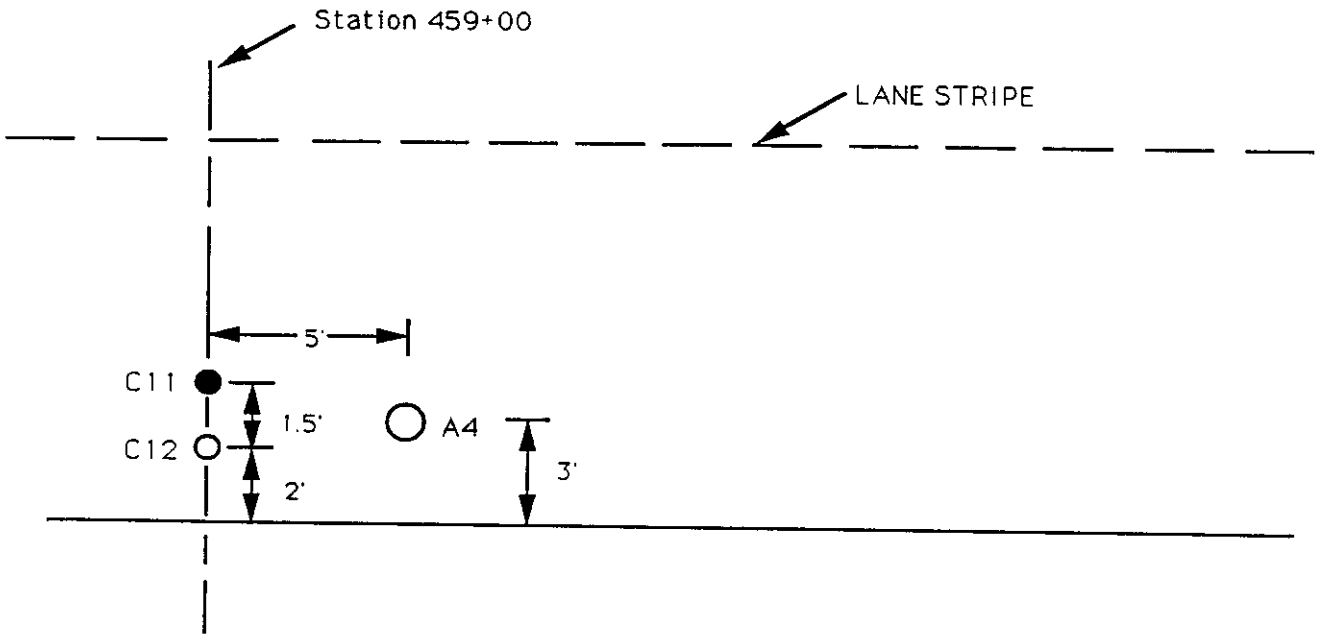


4" OD core of PCC pavement surface C9

4" OD core of PCC pavement surface and treated layers C10

6" OD core of PCC pavement and treated layers, augering of unstabilized base and subbase, thin-walled tube sampling and/or splitspoon sampling as directed by authorized SHRP representative to 5 below top of subgrade A3

Figure 6 Sampling plan for station 560+10 after section 5 Sampling area S5

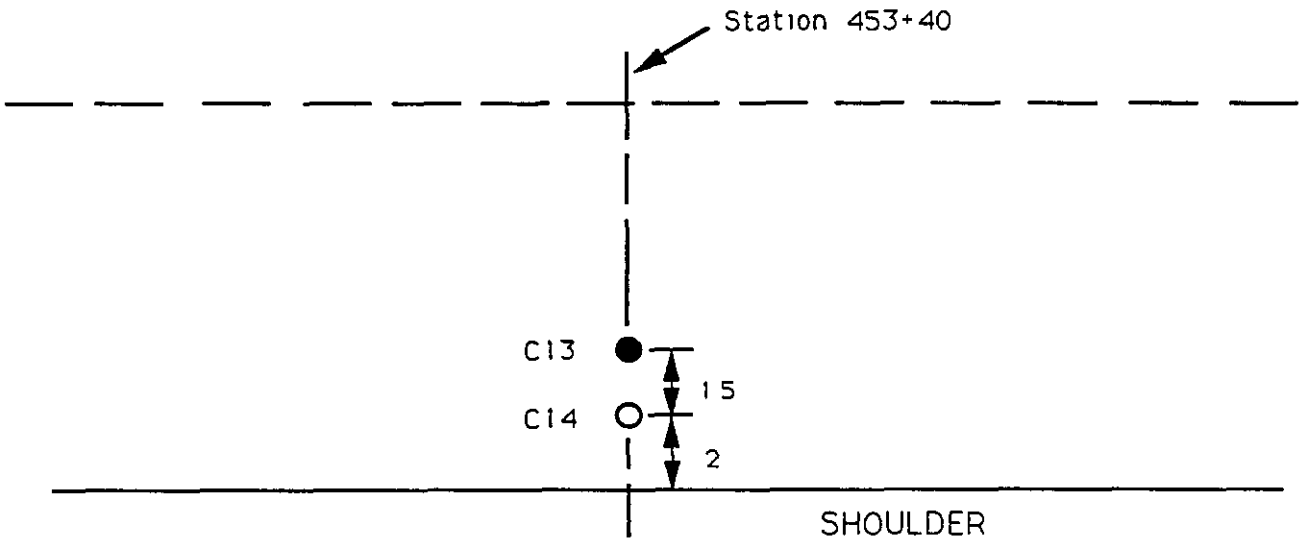


● 4" OD core of PCC pavement surface: C11

○ 4" OD core of PCC pavement surface and treated layers: C12

◯ 6" OD core of PCC pavement and treated layers; augering of unstabilized base and subbase; thin-walled tube sampling and/or splitspoon sampling as directed by authorized SHRP representative to 5' below top of subgrade: A4

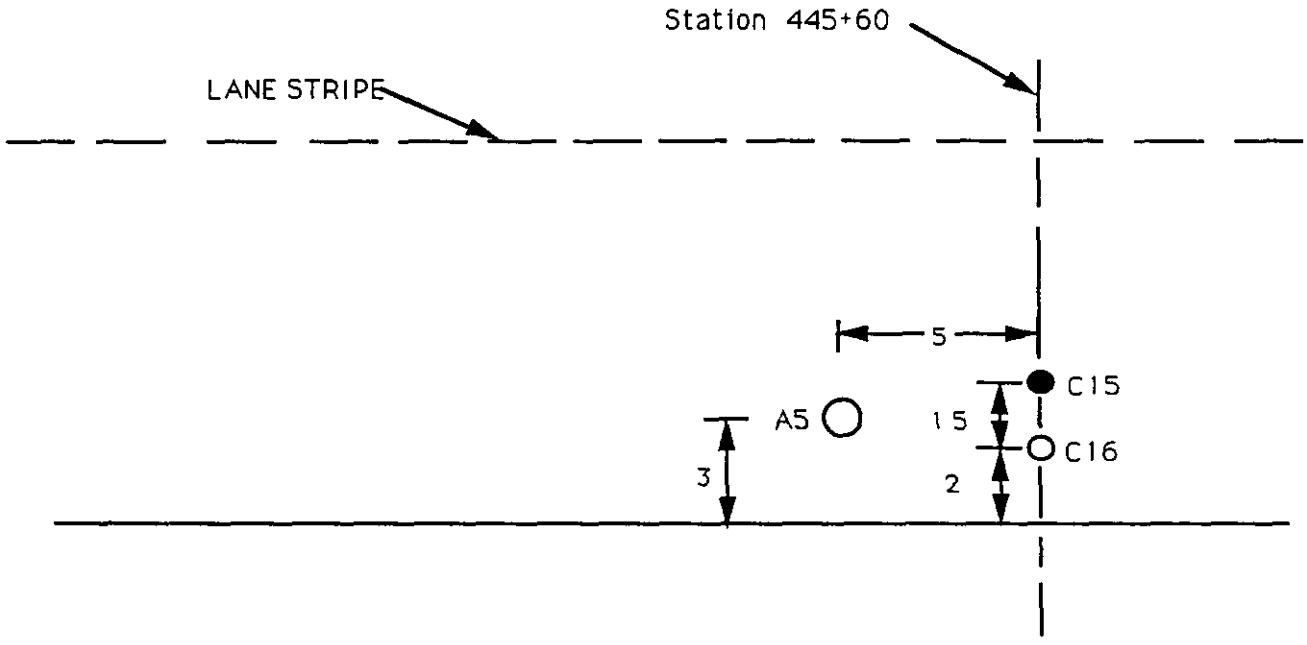
Figure 7. Sampling plan for station 459+00 before section 7. Sampling area S6.



● 4" OD core of PCC pavement surface C13

○ 4" OD core of PCC pavement surface and treated layers C14

Figure 8 Sampling plan for station 453+40 after section 7 Sampling area S7

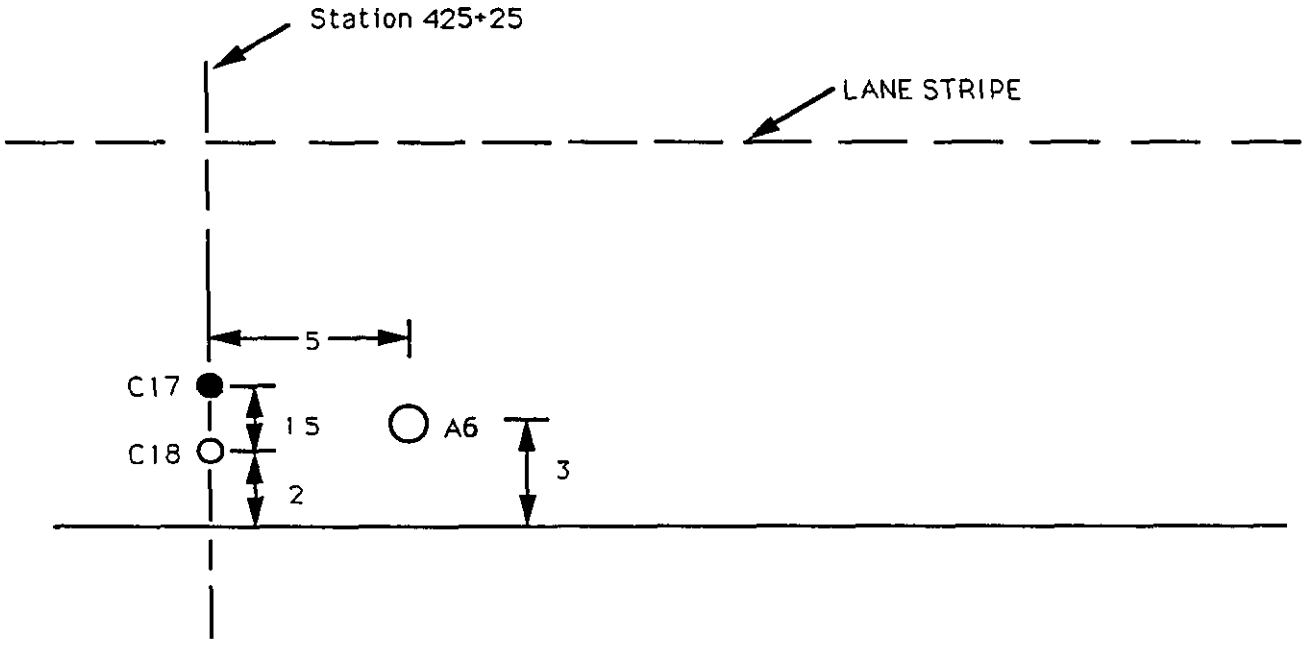


● 4" OD core of PCC pavement surface C15

○ 4' OD core of PCC pavement surface and treated layers C16

○ 6" OD core of PCC pavement and treated layers, augering of unstabilized base and subbase, thin-walled tube sampling and/or splitspoon sampling as directed by authorized SHRP representative to 5' below top of subgrade A5

Figure 9 Sampling plan for station 445+60 after section 8 Sampling area S8

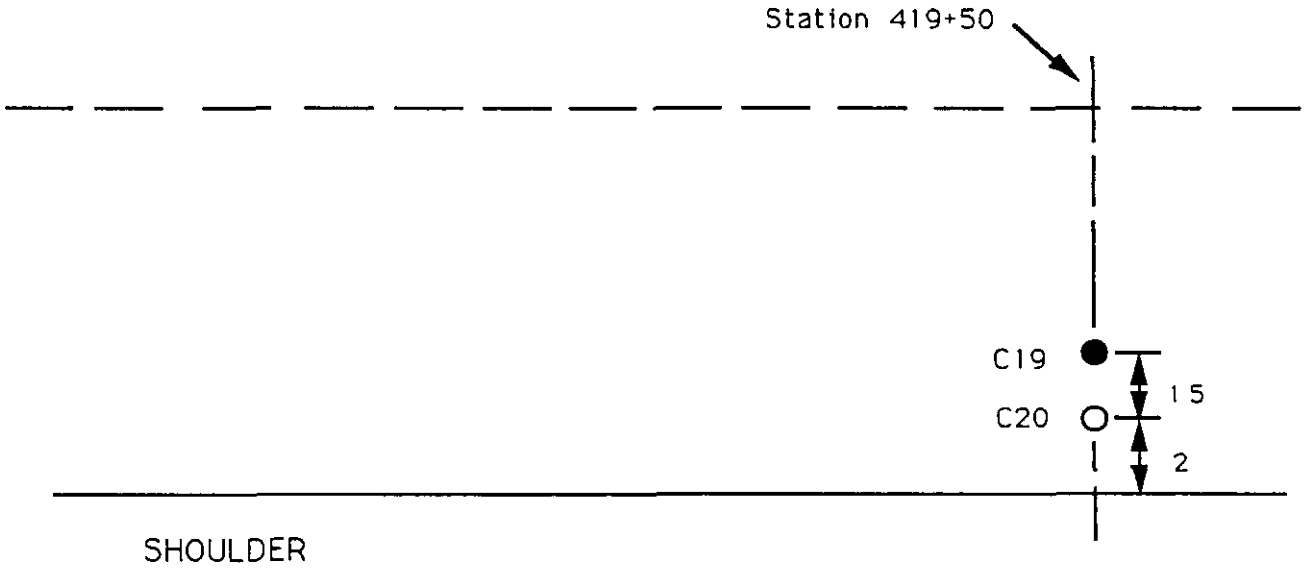


● 4" OD core of PCC pavement surface C17

○ 4" OD core of PCC pavement surface and treated layers C18

◯ 6" OD core of PCC pavement and treated layers, augering of unstabilized base and subbase, thin-walled tube sampling and/or splitspoon sampling as directed by authorized SHRP representative to 5' below top of subgrade A6

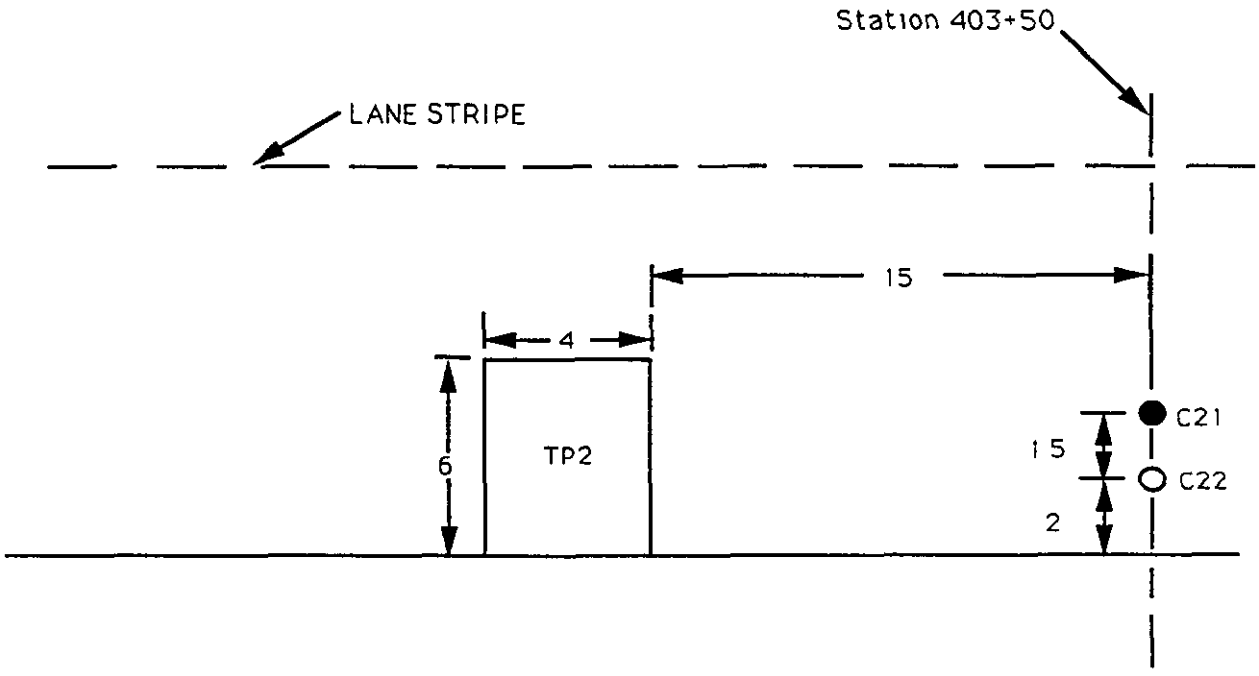
Figure 10 Sampling plan for station 425+25 before section 3 Sampling area S9



● 4" OD core of PCC pavement surface C19

○ 4" OD core of PCC pavement surface and treated layers C20

Figure 11 Sampling plan for station 419+50 after section 3 Sampling area S10

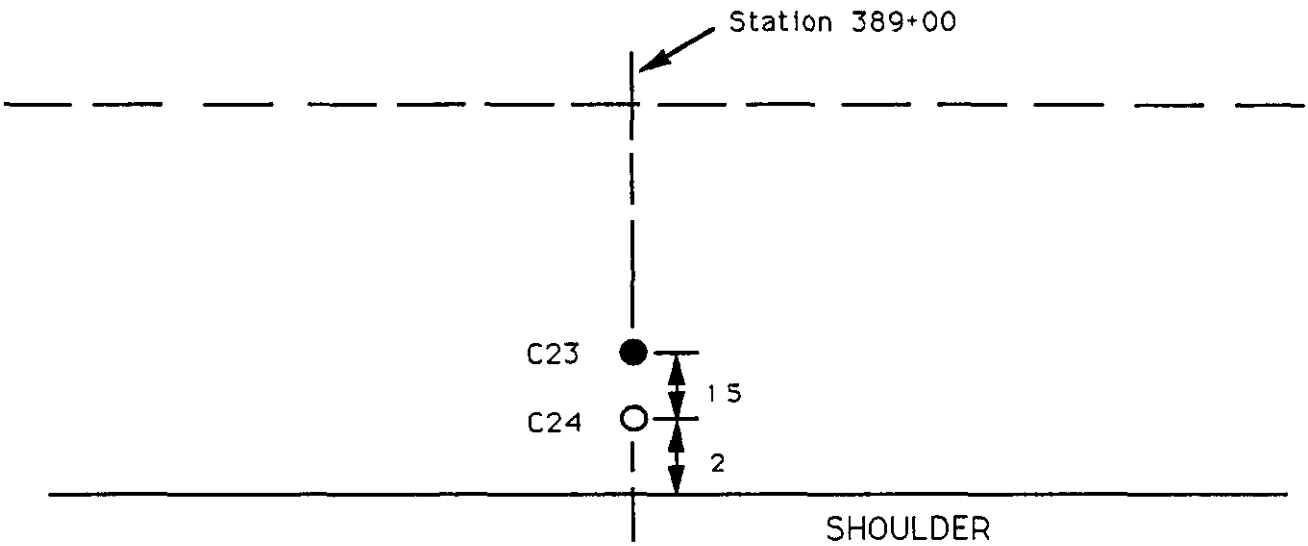


● 4" OD core of PCC pavement surface C21

○ 4" OD core of PCC pavement surface and treated base C22

4' X 6' test pit to 12" below top of subgrade Removal of pavement layers, collection of pavement slabs, nuclear density and moisture measurements on unstabilized layers and subgrade, bulk sampling of unstabilized layers and subgrade TP2

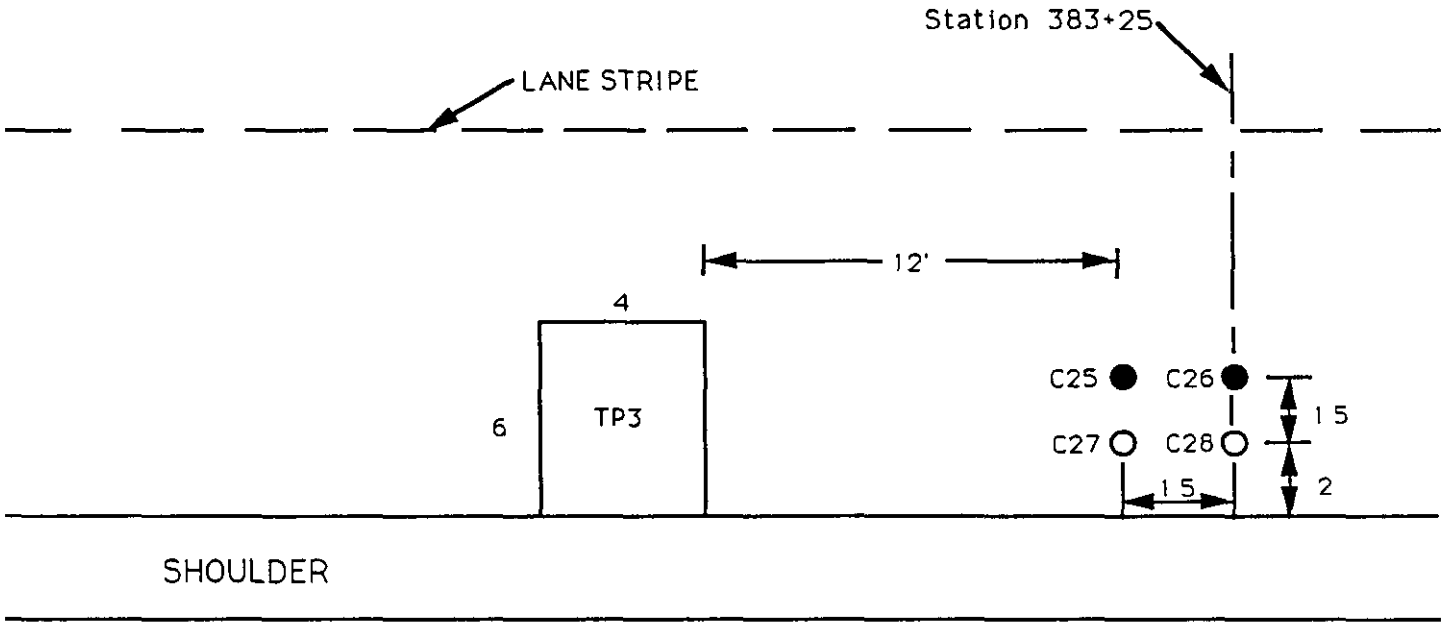
Figure 12 Sampling plan for station 403+50 after section 4 Sampling area S11



● 4' OD core of PCC pavement surface C23

○ 4" OD core of PCC pavement surface and treated layers C24

Figure 13 Sampling plan for station 389+00 before section 6 Sampling area S12



● 4" OD core of PCC pavement surface C25, C26

○ 4" OD core of PCC pavement surface and treated base C27, C28

4' X 6' test pit to 12" below top of subgrade Removal of pavement layers, collection of pavement slabs, nuclear density and moisture measurements on unstabilized layers and subgrade, bulk sampling of unstabilized layers and subgrade TP3

Figure 14 Sampling plan for station 383+25 after section 6 Sampling area S13

Attachment F

Letter to Agency Requesting Additional Information

BRAUN℠
INTERTEC

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Engineers and Scientists Serving the Built and Natural Environments®

November 8, 1995

Mr Charles Potter
Iowa DOT
800 Lincoln Way
Ames, IA 50010

Dear Charles

I am in the process of completing the construction report for FHWA on the SPS-6 project in Iowa The project is located on I-35 southbound, between Ames and Des Moine The project was constructed in 1989 I am not sure how much involvement you had on this project at that time This project was designated as a SHRP pilot project, and most of the construction guidelines were still being developed

I need some additional information or clarification on several items on the project

Ms Vicki Dumdei was the resident construction engineer My notes indicated that she was from the district office My records do not indicate the address of the district office, I assume it is different than yours

I am listing as people working on the project from the Iowa DOT as Vicki Dumdei as resident construction engineer and Mr Bernie Brown as the materials engineer for the project If you feel there should be other people listed in the report, please supply me with the names, addresses and phone numbers for the personnel

I need information for the weigh-in-motion (WIM) I need to know the type, the manufacturer with the address and also the location and who installed it

It is our understanding that Des Moines Asphalt and Paving Company was the prime contractor for the project I need to know the address and phone numbers and the foremen or contact person from Des Moines Asphalt Paving Company

I know that a lot of time has passed since the construction, but if possible, I would like to have Vicki Dumdei make a few short general comments on the activities and/or problems during construction

Also, I would like to the general comments from you and/or the maintenance engineer on the performance of the test sections Again, these comments should be only one or two sentences per section

These comments are important, but they should also be short because we are limited by the expected length of the report

Should you require any additional information or want to discuss this with me, please contact me at (612) 942-3055 at your convenience

Very truly yours,

Ronald R Urbach

Ronald R Urbach, CET

cc Ben Worel
Gene Skok
Dick Ingberg

g \wpfiles\becky\ron.u\charles.pot